

matting and scattered bird bones. A *ti* leaf sandal was observed on the west side of the tube opening, beneath a rough pile of rocks (Figure 51). Beyond the initial chamber, the tube expands to 4.0 m in diameter with a 0.5 m-high ceiling. No cultural material was observed in the back chamber. An ash deposit was observed just outside the entrance to the tube. Four bird cooking stone fragments reused as hammerstones (Art Nos. 2.1, 16.1, 17.1, and 18.1) were collected in proximity to the ash deposit. All four artifacts appear to be fire-affected (reddened) likely by the underlying hearth (SF1) identified in TU1 (see Testing Results below).

Feature 2 is an L-shaped wall constructed against the edge of the west side of the sink with a small overhang. The L-shape encloses a level soil floor 1.0 m by 1.5 m. The L-shape is mostly collapsed on the north side, filling in portions of the interior floor and forming a mounded slump on the exterior of the feature. Charcoal was observed beneath the overhang.

#### **Site 23626 Testing Results**

Two test units were excavated at Site 23626, outside of the Feature 1 tube entrance (TU1) and inside Feature 2 (L-shape) (TU2). The results are summarized below.

##### Feature 1 – TU1

A 0.5 m by 0.5 m unit (TU1) was excavated 0.45 m outside of the entrance to Feature 1 tube. The unit was placed over an ash deposit (SF1) and excavated to bedrock at a maximum depth of 38 cmbs. Two soil layers (Layers I and II) and a subsurface feature (SF 1) was identified in TU1 (Figures 52 and 53). The stratigraphic components are described as follows:

- Layer I (4-6 cm thick) dark grayish brown (10YR 4/2) silt loam with organics; structureless; loose, non-coherent, non-sticky, non-plastic; few rootlets; cultural material present.
- SF 1 (28 cm thick) very pale brown (10YR 8/2) ash; structureless; loose, non-coherent, non-sticky, non-plastic; few rootlets; cultural material present.
- Layer II (10-23 cm thick) very dark grayish brown (10YR 3/2) fine sand; loose, non-coherent, non-sticky, non-plastic; 15% cobble and pebble inclusions; cultural material present in SF1/Layer II interface.
- Layer II (25 cm thick) very dark brown (10 YR 3/2) fine sand; loose, non-coherent, non-sticky, non-plastic; 15% cobbles and pebble; cultural material near upper boundary.

Layer I was a thin organic-rich surface soil overlying the SF1 ash in the north and southwest corner portion of the unit. Cultural material was recovered from Layer I, including volcanic glass flakes, medium bird bone and charcoal.

SF1 is a hearth feature defined by a solid ash layer with a moderate amount of charcoal flecking. The feature yielded volcanic glass flakes, a broken bird cooking stone (Art 34.1), charcoal and an abundance of bird bone.

The majority of the bird bone (Table 12) was likely Hawaiian Petrel, represented by un-diagnostic medium bird (85%) and medium procellariid (9%). The faunal inventory also includes small procellariid (2%), not known to occupy the Saddle Area, and a miniscule amount of small passeriform, a perching bird or songbird comparable in size to cardinals or thrushes.



Figure 51. Ti Leaf Sandal (*kama'a*) at Site 23626

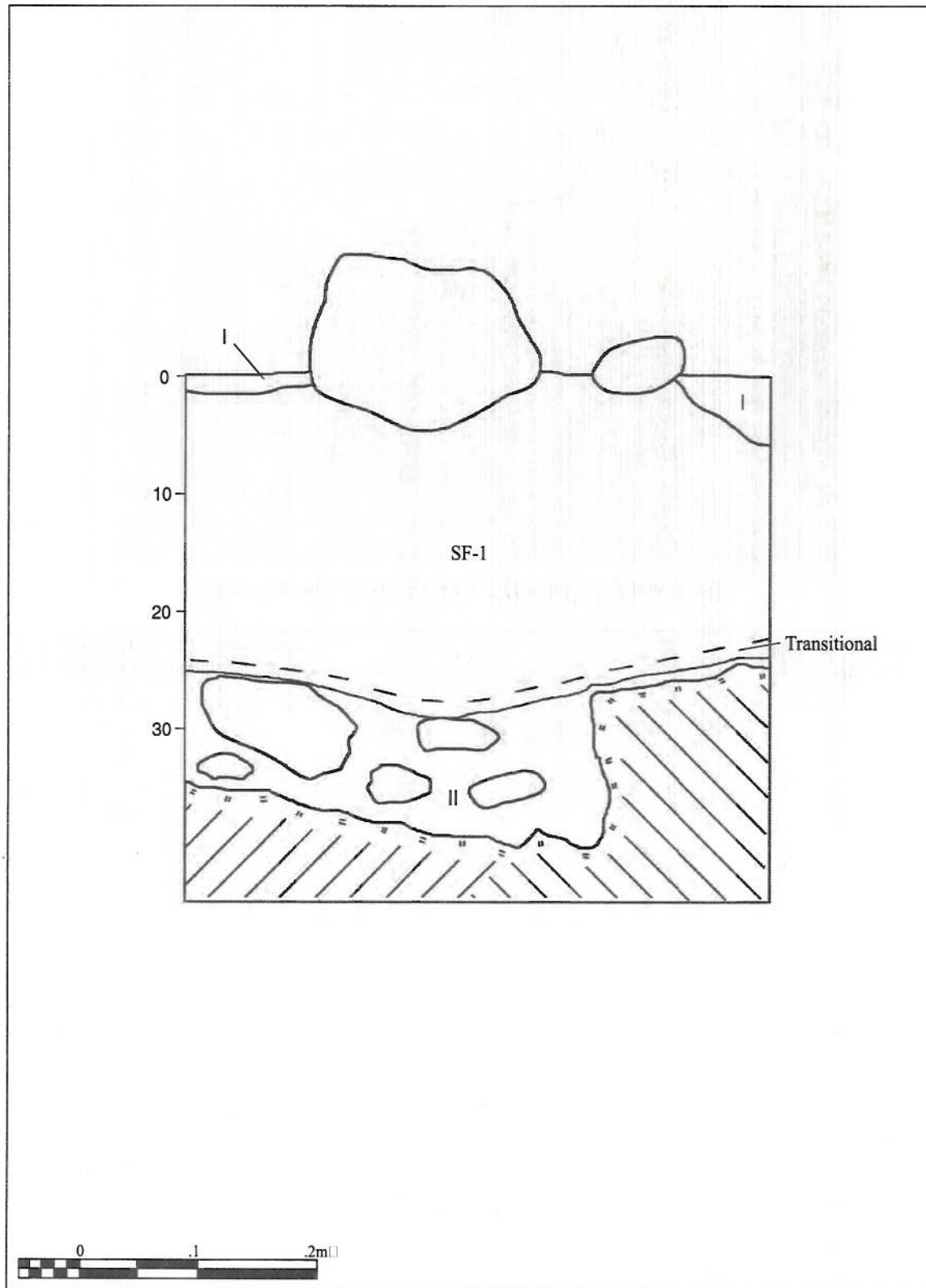
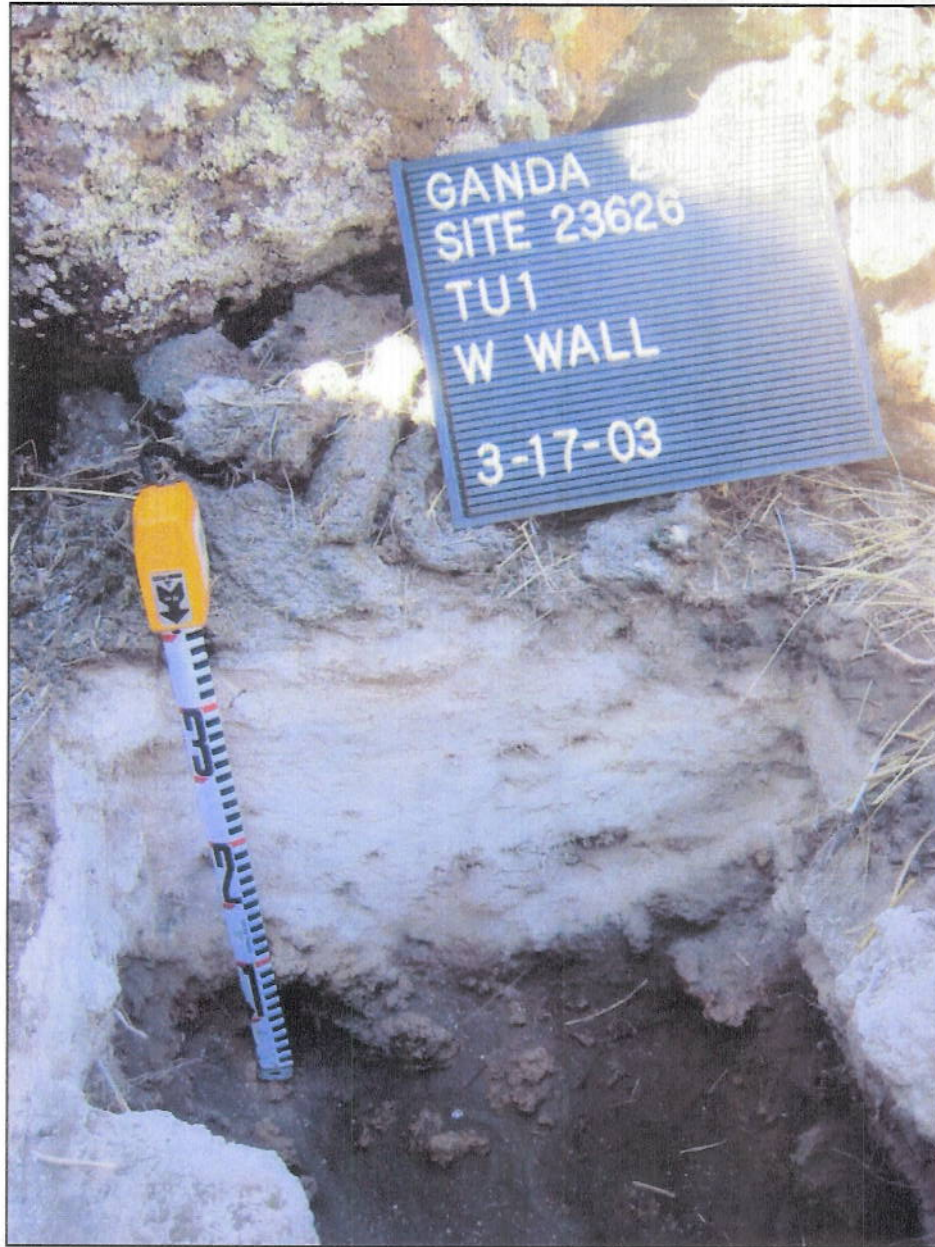


Figure 52. Site 23626 TU-1, West Profile





**Figure 53. Site 23626, Photo of TU1 West Profile**

Table 12. Summary of Site 23626 Feature 1 SF1 Faunal Remains

Concentration Index *(gms/m <sup>3</sup> )	Weight (gm)	Common Name(s)	Class	Species
N/A	< 0.01	Perching bird or Songbird	Aves	Passeriform – small
40.74	1.1	Christmas Shearwater, Bulwer's Petrel <i>et al.</i>	Aves	Procellariid – small
166.66	4.5	Wedge-tailed Shearwater, Newell's Shearwater and Hawaiian Petrel	Aves	Procellariid – medium
29.63	0.8	Hawaiian Petrel	Aves	<i>Pterodroma phaeopygia</i>
1470.37	39.7	Undetermined	Aves	Medium bird
14.81	0.4	Undetermined	Aves	Large bird
N/A	< 0.01	Polynesian Rat	Mammalia	<i>Rattus exulans</i>

\*Volume = 0.027 m<sup>3</sup>

Ziegler (2003) suggests that much of the small procellariid bones were burned and re-burned in the hearths, possibly because the bones were deposited in the hearth earlier than the less-burned Hawaiian Petrel. Dr. Ziegler also notes that the small procellariid, which represents various shearwaters and smaller petrel, might have been food provisions obtained at the coast and transported to the site. A roughly 2-cm transitional layer between SF1 and the underlying Layer II yielded a similar inventory of cultural materials as seen in SF1, but only medium procellariid and medium bird. This layer, included in the excavation of Layer II, was a mixture of SF1 ash, charcoal flecking and Layer II sediments. Layer II lay directly on outcrop and comprised fine sand similar to eolian sands observed on the surface of sink floors elsewhere in the project area.

Two charcoal samples recovered from similar contexts of SF1, but representing two different species, including *naio* (cf. *Myoporum sandwicense*) and 'a'ali'i (cf. *Dodonaea viscosa*), were submitted for radiocarbon analysis. Both samples produced similar calibrated (2  $\sigma$ ) multiple date ranges:

- A.D. 1640 to 1680; A.D. 1730 to 1810; and A.D. 1930 to 1950 ('a'ali'i)
- A.D. 1640 to 1690; A.D. 1730 to 1810; and A.D. 1920 to 1950 (*naio*)

Given the absence of Western post-Contact materials, the pre-Contact and early post-Contact dates (17th to early 19th centuries) are likely the most accurate.

### Discussion

The TU1 excavation contained a 30 cm thick hearth characterized by a relatively homogenous charcoal-flecked ash. The hearth location at the opening of Feature 1 provided a natural windbreak and sufficient light zone for cooking and consumption of Hawaiian Petrel nesting in the Saddle Area, and smaller procellariid, possibly carried from the coast as food rations and consumed at an earlier date than the Petrel (Ziegler 2003).

The presence of volcanic flakes with the bird bone may suggest birds were being butchered by severing the joints with volcanic glass flakes and scrapers (Ziegler 2003) that were obtained from the nearby volcanic glass quarries (e.g., Site 23458). The thick hearth deposit probably indicates a repeated use that, based on radiocarbon analysis, occurred during the later pre-Contact to early post-Contact eras.



**Feature 2 – Test Unit 2 (TU2)**

A 0.5 m by 0.5 m unit (TU2) was placed in the northeast corner of the L-shape, with the north wall of the unit against the interior facing of the L-shape. A volcanic glass flake was observed on the surface of the east side of the unit, but not collected. TU2 was excavated to a maximum depth of 33 cmbs. It was terminated due to an absence of cultural material and consistent rocky matrix. Two soil layers (Layers I and II) were identified in TU2 (Figures 54 and 55):

- Layer I (6-12 cm thick) dark grayish brown (10YR 4/2) silt loam; abrupt, wavy boundary; structureless; loose, non-coherent, non-sticky, non-plastic; common rootlets, 15% cobble inclusion; cultural material present
- Layer II (1-13 cm thick) dark brown (10YR 3/3) silt; abrupt, wavy boundary; structureless; loose, non-coherent, non-sticky, non-plastic; common rootlets, 15% cobble inclusion; charcoal present.

Layer I was the cultural layer associated with Feature 2 that filtered down into crevasses of the underlying *a'ā*-filled floor of the sink. The layer contained 8.3 gms of Hawaiian Petrel bone, a volcanic glass flake and 20.9 gms of charcoal. Layer II was in pockets of the underlying outcrop. Charcoal (6.1 gms) was recovered from the layer, but it likely filtered down from Layer I cultural layer.

**Discussion**

The TU2 excavation identified a sparse cultural deposit (Layer I) associated with occupation and activities inside Feature 2 (L-shape). At minimum, the recovered material indicates Hawaiian Petrel was the only bird being consumed at Feature 2, compared to the two types (Hawaiian Petrel and small procellariid) apparently consumed at Feature 1. The one flake recovered from the unit also suggests that limited lithic reduction activities occurred at Feature 2, or that the flake was used for butchering of birds.

No radiocarbon dates were obtained from the Feature 2 excavation; however, the absence of the smaller, more burned procellariid bone found in TU1 may indicate the L-shape was a later site component than Feature 1.

**6.2 ANTI-ARMOR LIVE FIRE AND TRAINING RANGE (AALFTR) SITE DESCRIPTIONS**

Eight sites have been documented inside the surveyed portion of the AALFTR (see Figure 11 and Table 13). Site 18673 was previously recorded by BioSystems (Shapiro *et al.* 1998) and Williams 2002).

**Table 13. Summary of Archaeological Sites in AALFTR**

SHPO Site (50-10-31-)	No of Features	Site Type	Function	Phase II	
				Tested	Mapped
18673	1	Lava tube	Repeated-use occupation	X	—
21285	1	Lava tube	Limited-use occupation	X	X
21299	1	Lava tube	Limited-use occupation	X	X
23463		Excavated pits	Possible bird hunting		X
23464	1	Lava tube	Limited-use occupation	X	X
23465	3	Lithic scatter; modified boulders	Lithic workshop; quarry		X
23622		Excavated pits	Possible bird hunting		X
23625	1	Lava tube	Limited-use occupation	X	X

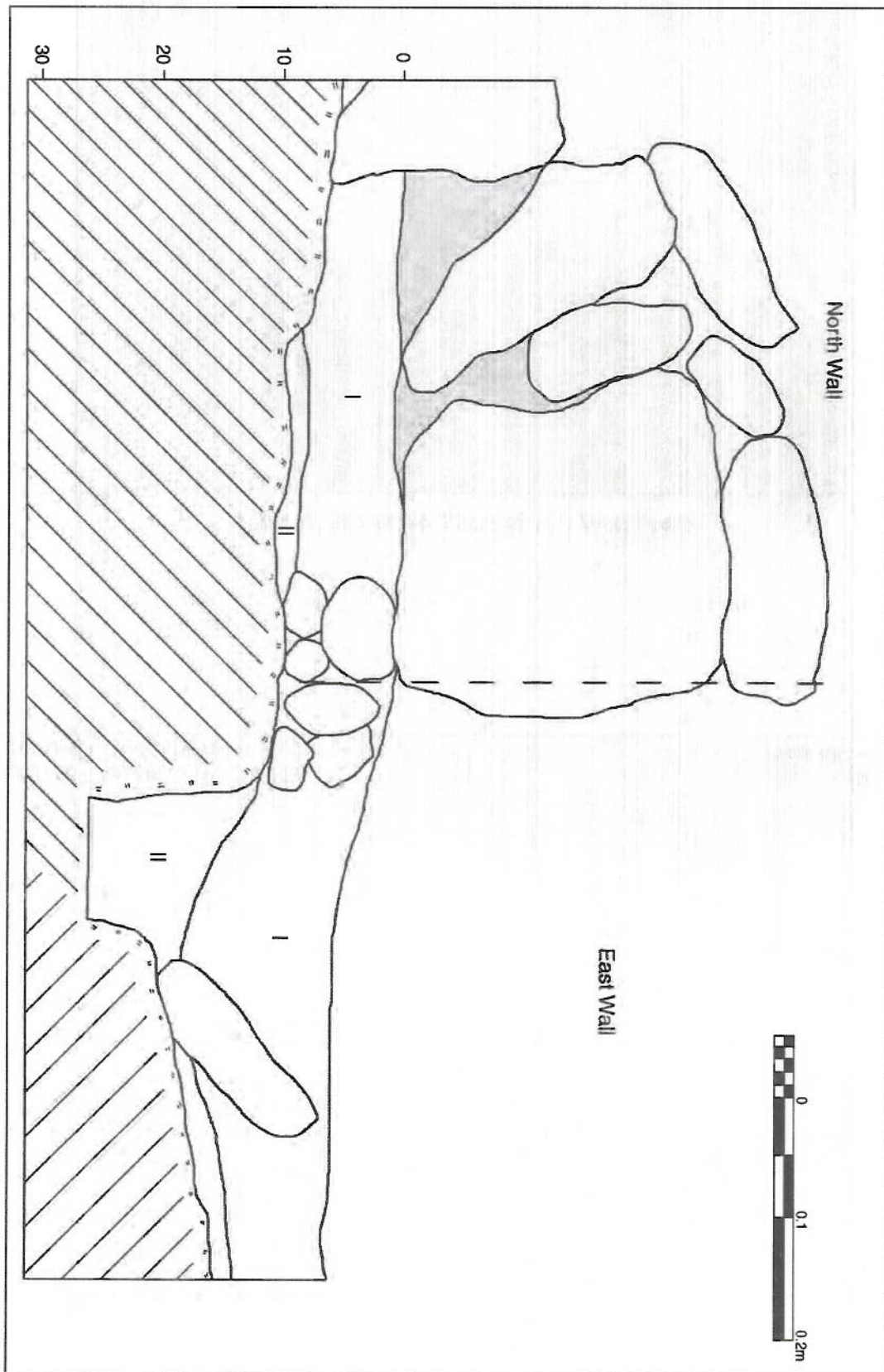


Figure 54. Site 23626, TU 2 Profiles



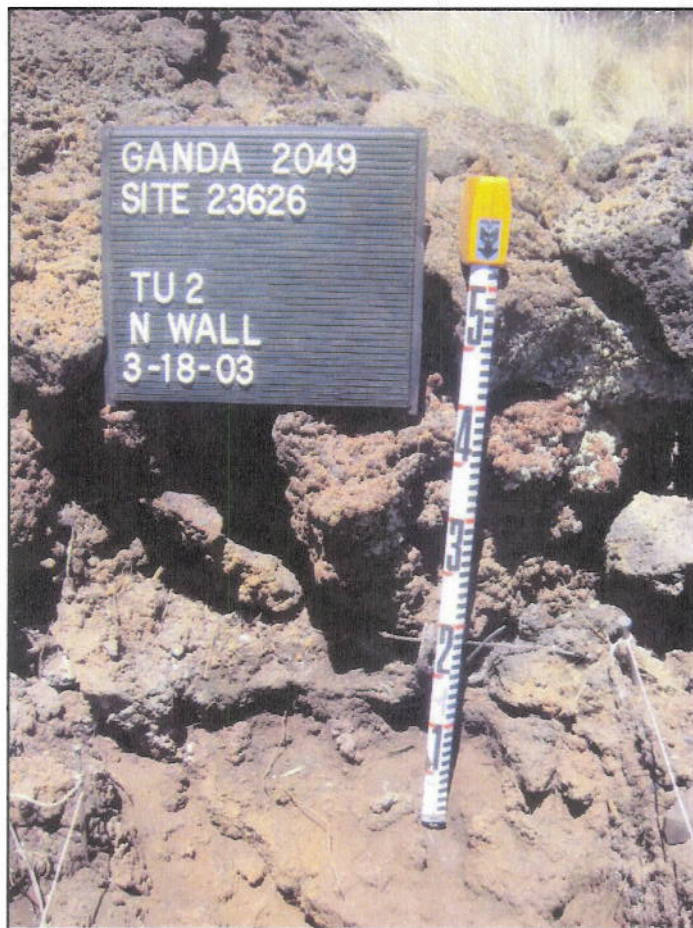


Figure 55. Site 23626, Feature 2, North Profile of TU2

**Site 50-10-31-18673**

**Training Area: Impact**

<b>Site Type:</b>	Lava tube
<b>Function:</b>	Recurrent-use occupation; ceremony
<b>Possible age:</b>	AD 1280-1680
<b>No. of Features:</b>	3 (inside lava tube)
<b>Site Size:</b>	90 m (NW/SE) by 8.0 to 10.0 m wide (0.008 hectare)
<b>Condition:</b>	Fair; cave floor impacted by ungulates
<b>Cultural Material:</b>	Gourds, matting, stone tools, ornament, charcoal and midden
<b>Significance:</b>	D: <i>Information potential</i> ; site yields important scientific data regarding Hawaiian occupation and resource exploitation in the Saddle Region.
<b>Historic Context:</b>	Traditional Hawaiian occupation (ca. AD 780 to Contact)
<b>Recommendation:</b>	Avoidance and protection during all SBCT-related projects.

**Description:** Site 18673 is an extensive lava tube system located in a weathered *pāhoehoe* flow (klo flow) formed 5,000 to 10,000 years ago. The site is roughly 770 m west of Redleg Road. An *a'ā* flow is around 60 m southwest of the site. The site was previously documented by BioSystems (Shapiro *et al.* 1998:30-36) as a Hawaiian shelter with a possible ceremonial component. The single tube, aligned northwest-southeast, is accessed through a central, collapsed sink (Figures 56-59). According to Shapiro *et al.* (1998:30), PTA Range Control shielded the southeast tube entrance with a roll of barbed-wire fencing (see Figure 58).



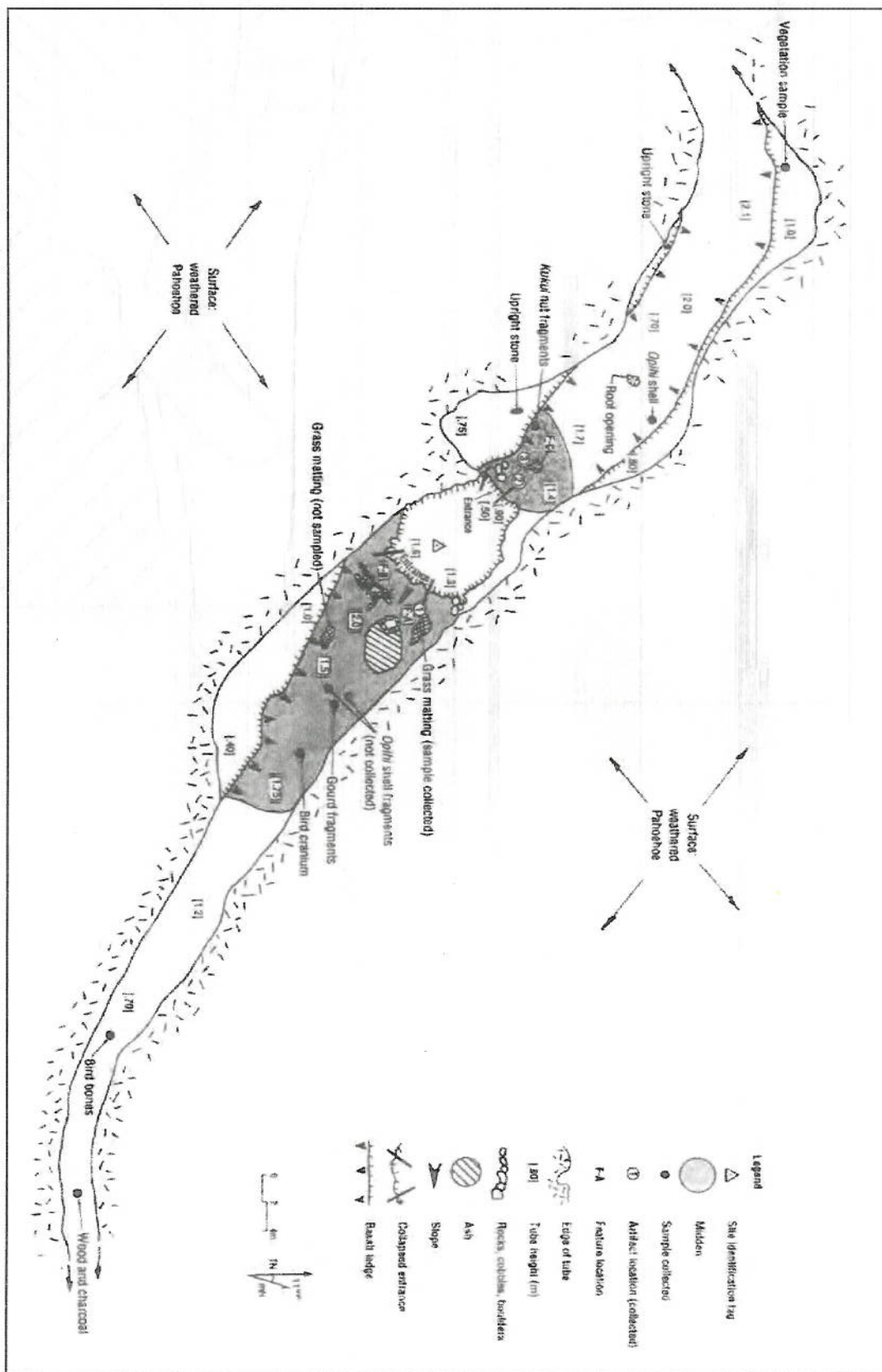
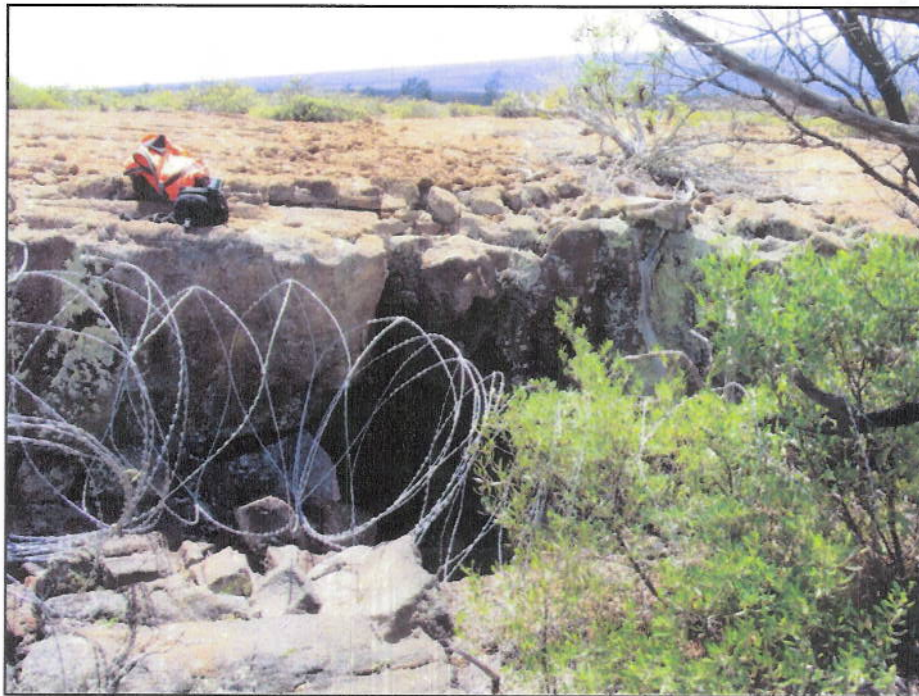


Figure 56. Plan View of Site 18673 (From Shapiro et al. 1998)



**Figure 57. Site 18673; View Southeast of Sink Area**



**Figure 58. Site 18673; View Southeast Entrance of Lava Tube (Note: Barbed-Wire Shield)**





**Figure 59. Site 18673; Entrance Chamber of Southeast Lava Tube (Note: Feature C Hearth in Foreground)**

In addition to recording the site, Shapiro *et al.* collected cultural material from the site, including grass matting, gourd pieces, a slingstone or bird cooking stone, volcanic glass, perforated 'opihi shell, bird bone and kukui nut. Three charcoal samples were also collected from different locations within the lava tube, producing radiocarbon ages calibrated ( $2\sigma$ ) to AD 1280 to 1460; AD 1390 to 1530; and AD 1460 to 1680 (Shapiro *et al.* 1998:36). The site was accurately located during the current study with a gps; this location is shown on Figure 11).

The site is summarized below as it appeared in Shapiro *et al.* (1998:30, 36):

It's collapsed sink measures 10 m by 8 m wide and 1.6 m deep and provides entrance into two tube chambers. The tube is oriented in a northwest to southeast direction. The south tube and entrance are larger than the north tube. The cultural extent of the south tube extends 52 m from the entrance and the interior maintains a maximum width of 9 m and height of 0.5 to 2 m. The majority of the cultural constituents were located within the interiors initial 15 m near the entrance. Two features were recorded in the south tube: a rock-lined hearth with ash and charcoal (Feature A); and a rock alignment with areas of cleared rocks that possibly represents a sleeping place (Feature B). Cultural materials in the north tube extend approximately 25 m from the entrance. The maximum width of the north tube is 8 m and height ranges from 0.5 m to 2 m. A fire hearth (Feature C) is positioned near the north tube entrance.

Unlike the south tube, three upright stones of pahoehoe were found inside the north tube on basalt ledges. Two were still standing and one has fallen. These may represent shrines, or places for ceremonial offerings. Artifacts were not found in close association with the upright stones. Minimally, the uprights indicate a religious or ceremonial function at the site (cf. Buck 1957:465; 529; Kamakau 1976:130).

<b>Site 50-10-31-21285</b>		<b>GANDA Site:</b>	900
<b>Site Type:</b>	Lava tube	<b>Training Area:</b>	Impact
<b>Function:</b>	Limited-use occupation		
<b>Possible age:</b>	AD 1170-1300		
<b>No. of Features:</b>	1		
<b>Site Size:</b>	30.0 m x 6.0 m (0.001 hectare)		
<b>Cultural Material:</b>	burnt <i>naio</i> log		
<b>Condition:</b>	Good		
<b>Significance:</b>	D: <i>Information potential</i> ; site yields important scientific data regarding Hawaiian occupation and resource exploitation in the Saddle Region.		
<b>Historic Context:</b>	Traditional Hawaiian occupation ( <i>ca.</i> AD 780-Contact)		
<b>Recommendation:</b>	Avoidance and protection during all SBCT-related projects.		

**Description:** Site 21285 is a north-south lava tube accessed through a vertical sinkhole that drops 1.3 m below the ground surface (Figures 60 and 61). This site is located on a weathered *pāhoehoe* lava flow (k1o flow) at the eastern edge of a dominant *a'ā* lava flow (k4 flow). A *pāhoehoe* pit excavation associated with a larger complex of similar pit features (Site 23463) lies beyond the tube formation, roughly 2 m west of the entrance. A limited-use hearth (Feature 1) (Figure 62) and possible sleeping area (Feature 2) (Figure 63) are inside the lava tube.

The accessible portion of the lava tube is 35.0 m (N/S) by 7.0 m with a maximum ceiling height of 1.3 m. A raised outcrop floor, 14.0 m long by 5.0 m wide and 1.0 m high, is at the center of the tube and accessed directly from the entrance. The remaining tube floor is relatively flat lava with ceiling fall tumbled along the central east wall. A burnt *naio* log was observed on the north side of the ceiling collapse.

Feature 1, a 0.8 m<sup>2</sup> ash and charcoal concentration, was on the west edge of the ledge. Feature 2, a cobble paving is on a level surface of the ledge, 1.0 m northeast of the entrance. The paving is 1.0 m by 1.5 m and comprises small, angular cobbles.

#### Site 21285 Testing Results

The ash and charcoal deposit (Feature 1) was excavated as a bulk sample and screened at the GANDA laboratory. The feature was 1 cm thick and lay directly on outcrop. A total of 2.2 g of charcoal was recovered from the excavation that consisted primarily of native flora.

Two charcoal samples representing different tree species (*'ohi'a lehua* and *pukiawe*) were submitted for radiocarbon dating analysis. The samples produced overlapping calibrated (2σ) date ranges: AD 1170 to 1280 and AD 1240 to 1300

#### Discussion

The absence of cultural material in Feature 1 suggests the charred wood and ash concentration was a hearth used for heat and to create light in the dark lava tube. The radiocarbon dates indicate the cave may have been occupied relatively early in the pre-Contact period, *ca.* 12<sup>th</sup> to 13<sup>th</sup> centuries. The absence of cultural material and hastily constructed paving also suggests the site was a limited-use occupation, likely used as a day or overnight shelter while traveling through the area.



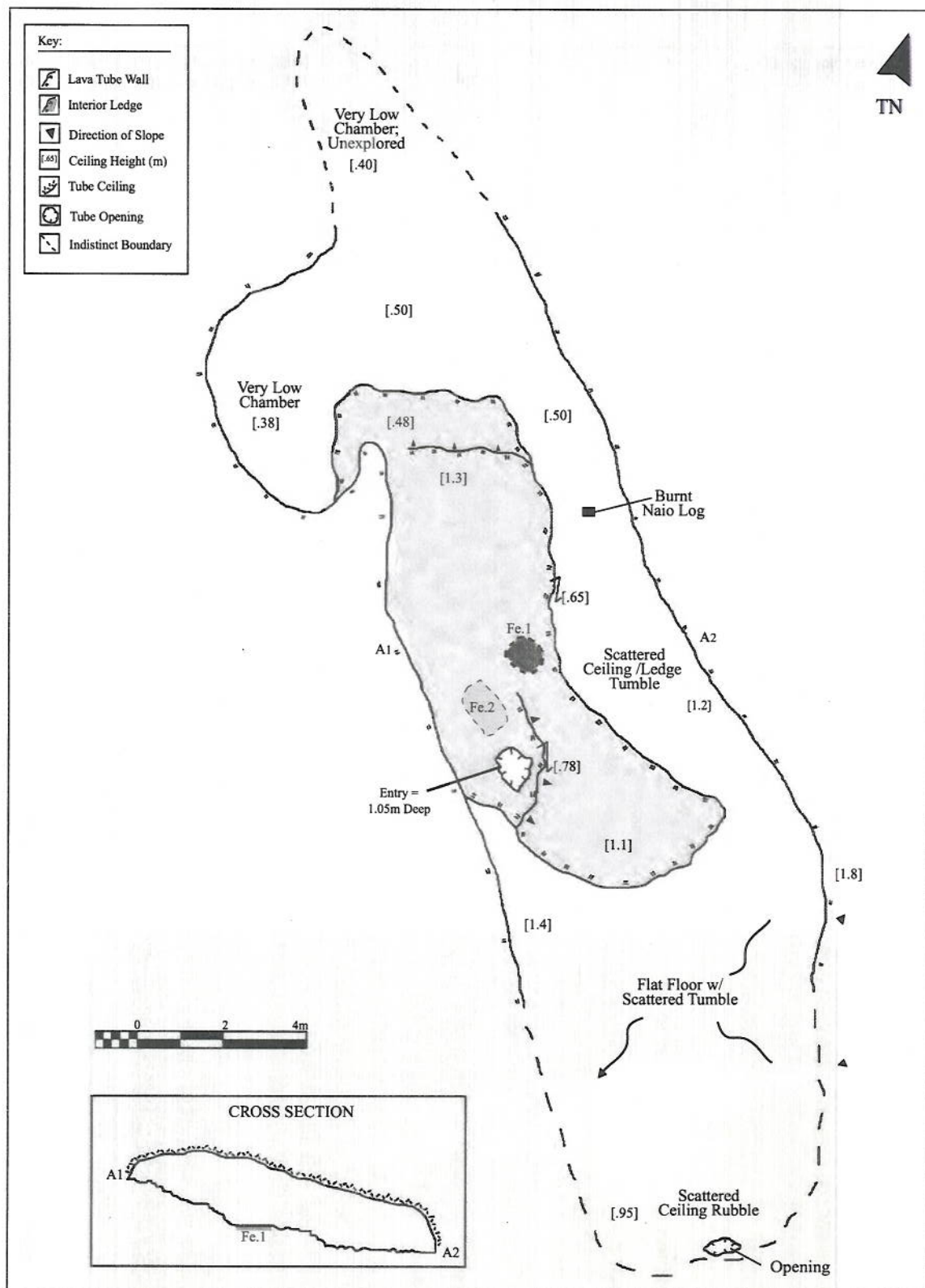


Figure 60. Site 21285; Plan View